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“Hydrogem” -a new glycerin additive to improve the application of agrochemicals

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Abstract.

This paper deals with “Hydrogem” a new glycerin based additive that is under development in Brazil that shows great promise in improving the efficiency of the aerial application of agrochemicals. This product has been developed from approximately 10% of the by-products from the production of Biodiesel that otherwise would be wasted and presents an excellent alternative to more expensive mineral or vegetable oils as a vehicle for low volume applications. Furthermore Hydrogem is a natural product easily mixable with water and bio-degradable in addition to having low volatility that assists in reducing evaporation and improving deposition of the spray droplets.

Field tests in 2007/2008 have confirmed that the product improves spray deposition especially so when added to spray solutions that are applied at low volumes of 5 -10 liters/ha [0.5 – 1.0 gpa] for the control of pests and diseases in a range of crops including soybeans, corn and cotton.

Keywords. Aerial application, biodiesel waste, low volumes, control of evaporation, drift reduction and the effects of volumes on spray deposition.

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Introduction

The patent holder Ariel Orlando Destéfano, has been conducting research since 2005 with respect to the utilization of biodiesel residues in agriculture. In the year 2007 a production facility was installed on the property of one of the largest soybean growers in the state of Mato Grosso, Brazil for their own consumption. A total of 800,000 liters [211,000 gallons] have been sprayed via aerial and ground applications in low spray volumes, to increase operational capacity and to reduce costs.

According to several researchers raw soybean oil doesn't have anti-evaporant or drift reducing properties. The organizations that conducted the tests are as follows:

- State University of Sao Paulo UNESP Botucatu - Dr. Ulisses Antoniasse
- Agricultural Institute of Agronomy of Campinas Doutor Hamilton Ramos
- Effects of mineral and vegetable oils on the physical properties of spray solutions – Dra. Cristina Gonçalves de Mendonça UNESP – BOTUCATU – Faculdade de Ciências Agrônomicas.

Our product was evaluated by the following researchers:

Prof. Dr. Wellington Pereira Alencar de Carvalho⁽¹⁾

- ⁽¹⁾ Coordenador em Aviação Agrícola / Prof. Máquinas e Mecanização Agrícola-Tecnologia de Aplicação. wellingt@ufla.br (35) 9979-0350 / 3829-1668 Departamento de Engenharia (DEG).

Prof. Dr. Paulo César de Melo ⁽²⁾

- ⁽²⁾ Correção/fertilidade do solo e nutrição mineral de plantas/Prof. Manejo de Adubação/Nutrição foliar de frutíferas. pcmelo@ufla.br (35) 8863-5763 / 3829-1333. Departamento de Agricultura (DAG).

Universidade Federal de Lavras – UFLA

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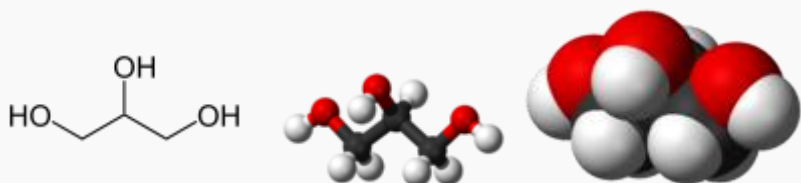
Departamento de Agricultura – DAG

We have identified through our research and field development that the glycerin or glycerol obtained from biodiesel can be converted into a valuable product for use in agriculture. This is of great significance since the product is being produced in very large volumes in biodiesel production and these volumes present major disposal problems. This new product has been named “Hydrogem” and is registered with the Ministry of Agriculture in Brazil. Discussions are at an advanced stage and an agreement is expected to be signed by Dec/15/2009 with a major company in the soybean business in Brazil for the production of large quantities specifically for Low Volume Spraying.

Other companies have registered products containing 93% glycerin as anti-evaporants however this product is notably different since it contains organic adhesives, other elements and additives that have the effect of stimulating photosynthesis.

What is Glycerol? from Wikipedia, the free encyclopedia

"Glycerine" and "Glycerin" redirect here. For the Bush song, see [Glycerine \(song\)](#).



Other names	glycerin glycerine propane-1,2,3-triol 1,2,3-propanetriol 1,2,3-trihydroxypropane glyceritol glycyl alcohol
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Properties

Molecular formula	C ₃ H ₅ (OH) ₃
Molar mass	92.09382 g/mol
Appearance	clear, colorless liquid hygroscopic
Odor	odorless
Density	1.261 g/cm ³
Melting point	18 °C (64.4°F)
Boiling point	290 °C (554°F) ^[1]
Refractive index (<i>n</i> _D)	1.4746
Viscosity	1.5 Pa·s
Flash point	160 °C (closed cup) 176 °C (open cup)

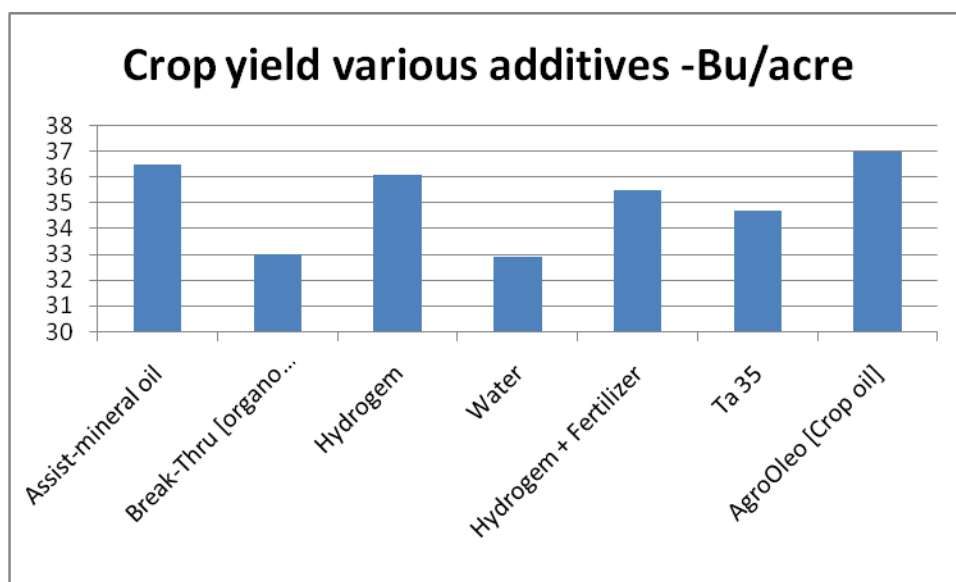
Glycerol is an [organic compound](#), also commonly called **glycerin** or **glycerine**. It is a colorless, odorless, viscous liquid that is widely used in pharmaceutical formulations. Glycerol has three [hydrophilic hydroxyl groups](#) that are responsible for its solubility in [water](#) and its [hygroscopic](#) nature. The glycerol substructure is a central component of many [lipids](#). Glycerol is sweet-tasting and of low toxicity

Summary

Glycerol, also known as propane-1,2,3-triol, was discovered by Scheele in 1779 who extracted it from a heated mixture of litharge and olive oil. Currently, glycerol has a large industrial application, particularly in the production of synthetic resins, ester gums, drugs, cosmetics and toothpastes. It is also used in large amounts during the processing of tobacco and foods. This clear, viscous, hygroscopic trihydric alcohol is an important intermediate in the metabolism of living organisms and it has been found naturally in a combined form as glycerides in animals and vegetable fats and oils. Glycerol can also be recovered as a by-product when these oils are saponified in the industrial process of soap manufacturing, or by separating it from the fats in the production of fatty acids. While the process of glycerol microbiological production has been known for 150 years, its commercial production has been carried out using propylene synthesis only since 1949. This fact is due to the low yield of the microbiological process when compared to the chemical process, and its difficult extraction and purification from broth.

Keywords: glycerol, propane-1,2,3-triol, glycerin, osmoregulator

RESULTS: Field trials conducted in soybeans in Brazil



The product has shown the following characteristics:

- Drift reducing agent – thanks to its density of 1.26
- Anti-evaporante – boiling point 290°C [554°F] Tests have shown that evaporation losses were reduced to less than 0.5% with concentrations of 5% of the spray solution.
- Sticker
- Stimulant for the penetration and absorption of agricultural chemicals
- Sequestration of cations

Viability of Glycerin as an adjuvant in the spray solution Glyphosate via the system BVO® “Low Volume with Oil”

Cleber Daniel de Goes Maciel¹; Wagner Justiniano²; Marcos Vilela de Magalhães Monteiro²; Antônio Mendes de Oliveira Neto³; Gesley Ramos Guimarães Lima³; Luiz Carlos Sola Júnior³; João Igor de Souza⁴; Jessica Tiemi Hama Hama⁴
¹FUNGE/ESAPP, Prof. Depto de Fitotecnia, CEP19700-000. Paraguaçu Paulista/SP; ²**CBB - Centro Brasileiro de Bioaeronáutica**, CEP18085-420, Sorocaba/SP; ³Acadêmicos do Curso de Agronomia da FUNGE/ESAPP; ⁴Acadêmicos do Curso de Agronomia das FIO, Rodovia BR153, Bairro Água do Cateto. Ourinhos/SP

Conclusion

The trials in Brazil that have been conducted during the past 2 seasons have confirmed that the product named “Hydrogem” can be used as an effective spray additive. The product also show promise in increasing the absorption rate of agrochemicals. Furthermore this glycerin based product provides an attractive and economic method of utilizing large volumes of waste byproduct from the process of producing biodiesel from soybeans.

The only inconvenient aspect has been the need to reduce the level of product with some herbicides to avoid phytotoxicity.

Acknowledgements:

Prof. Dr. Wellington Pereira Alencar de Carvalho⁽¹⁾

Prof. Dr. Paulo César de Melo ⁽²⁾

References

Dec. 2003 Effect of vegetable and mineral oils on the physio/chemical properties of spray solutions and their interactions with foliar surfaces.

Cristina Gonçalves Mendonça.

[Byproduct of biodiesel production effective in swine and poultry \[GLYCERIN!\]](#)

[High Plains Journal](#) ^ 04/28/2008 Staff

Posted on Monday, April 28, 2008 7:50:45 AM by Red Badger

Iowa Research yields pricey chemicals from biodiesel waste

EurekaAlert.com

Rice engineers ID 'green' methods to make valuable organic acids

HOUSTON -- June 30, 2008

Labels: [biodiesel](#), [glycerin](#), [USDA](#)

[Thursday, September 25, 2008](#)

[Glycerin market in 2008 is a tale of two grades: Crude vs. refined](#)

Purchasing.com *Refined glycerin prices shoot up, while crude glycerin prices tick down in an unlikely market trend.* By Gordon Graff –

<http://bioenergyuiuc.blogspot.com/search?q=glycerin>
Wednesday, October 29, 2008 Adding Value to Biofuel Waste

USDA CSREES

Media Contact: Jennifer Martin, (202) 720-8188

By Stacy Kish, CSREES Staff October 20, 2008

Journal article

Priscilla Vaz de Arruda, Rita de Cassia, L.B. Rodrigues. Escola de Engenharia de Lorena, EEL/USP. "Glicerol: Um subproduto com grande capacidade industrial e metabolica. Revista Analytica, dezembro 2006/janeiro 2007 No.26

Wednesday, June 27, 2007

Technology Turns Glycerin into Ethanol

U.S. scientists have developed a technology designed to convert waste glycerin from biodiesel plants into ethanol, another popular biofuel. ([The Money Times, June 26, 2007](#))

Posted by CABER-Staff at 9:29 AM

Published Paper

Viability of Glycerin as an adjuvant in the spray solution

Glyphosate via the system BVO® "Low Volume with Oil"

Cleber Daniel de Goes Maciel¹; Wagner Justiniano²; **Marcos Vilela de Magalhães Monteiro²**; Antônio Mendes de Oliveira Neto³; Gesley Ramos Guimarães Lima³; Luiz Carlos Sola Júnior³; João Igor de Souza⁴; Jessica Tiemi Hama Hama⁴

¹FUNGE/ESAPP, Prof. Depto de Fitotecnia, CEP19700-000. Paraguaçu Paulista/SP; **²CBB - Centro Brasileiro de Bioaeronáutica**, CEP18085-420, Sorocaba/SP; ³Acadêmicos do Curso de Agronomia da FUNGE/ESAPP; ⁴Acadêmicos do Curso de Agronomia das FIO, Rodovia BR153, Bairro Água do Cateto. Ourinhos/SP

Thesis of a by-product of Biodiesel as an agricultural adjuvant.

¹Lima Marcai V.S; Nunes Rafael C da R; Araujo, Bruno Q; Figueiredo², Francisco C. Santos, Jose A.V; Santos Junior³, Jose R. Dos

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3. Researcher, Universidade Federal do Piaui, Teresina, Piaui, Brasil.

Online Source

<http://en.wikipedia.org/wiki/Glycerol> Definition of glycerol

Patent

Ariel Orlando Destéfano, Holder of Patent No:0703636-1A: registered with the Institute INPI 30/08/2007

The patent covers the transformation of residues produced in the production of biodiesel for use in adjuvants, foliar fertilizers or agricultural additives such as chelating and pH conditioning agents.